What is claimed is:

1. A displacement sensor for a substance dispensing device having a translating piston, the sensor comprising:

   a. a plunger rod coupled to the piston bearing an encoded pattern of encoding features;

   b. a light source for illuminating the encoded pattern;

   c. a detector array for detecting light from the illuminated encoded pattern and generating a detector signal; and

   d. a processor for determining a displacement of the plunger rod relative to a fiducial reference position based at least on the detector signal.

2. A displacement sensor according to claim 1, wherein the encoding features are regions of modulated optical transmission through the plunger rod.

3. A displacement sensor according to claim 1, wherein the encoding features are regions of modulated optical reflection by the plunger rod.

4. A displacement sensor according to claim 1, wherein the encoding features are a plurality of slots of enhanced transmission through the plunger rod.

5. A displacement sensor according to claim 4, wherein each slot is displaced from each pair of nearest neighbors by a unique combination of distances.

6. A displacement sensor according to claim 4, wherein the combination of any two adjacent spaces between slots uniquely identifies a characteristic of the reservoir.

7. A displacement sensor according to claim 6, wherein the identified characteristic of the reservoir is a displacement relative to a fiducial position.

8. A displacement sensor according to claim 6, wherein the identified characteristic of the reservoir is content of a reservoir to which the plunger rod pertains.

9. A displacement sensor according to claim 6, wherein the identified characteristic of the reservoir includes at least one of diameter and wall composition material.

10. A displacement sensor according to claim 1, wherein the light source includes an optical diffuser for illuminating a region of the plunger rod with substantially uniform

optical intensity.

11. A displacement sensor according to claim 1, wherein the encoded pattern of encoding features repeats along the plunger rod.

12. A dispensing apparatus comprising:

a. a reservoir having a cylindrical inner volume for containing a substance;

b. a plunger rod for impelling a piston along a linear axis of motion within the inner volume of the reservoir in order to displace and dispense a measured quantity of the substance;

c. an encoding pattern of encoding features disposed along the plunger rod in a direction parallel to the linear axis of motion of the piston;

d. a detector array for detecting light from the illuminated encoded pattern and generating a detector signal; and

e. a processor for determining a displacement of the plunger rod relative to a fiducial reference position based at least on the detector signal.

13. A dispensing apparatus according to claim 12, wherein the encoding features are regions of modulated optical transmission through the plunger rod.

14. A dispensing apparatus according to claim 12, wherein the encoding features are a plurality of slots of enhanced transmission through the plunger rod.

15. A dispensing apparatus according to claim 12, wherein each slot is displaced from the pair of nearest neighbors by a unique combination of distances.

16. A dispensing apparatus according to claim 12, having more than 1 reservoir version, wherein the encoding pattern is uniquely determinative of a version of the reservoir.

17. A method for measuring a rate of dispensing a substance by means of a dispenser having a piston driven along an axis of motion within a reservoir of the substance, the method comprising:

a. illuminating an encoded pattern of encoding features disposed upon

a plunger rod coupled to the piston;

b. detecting light from the illuminated encoding features and generating a detector signal; and

c. determining a displacement of the plunger rod relative to a fiducial reference position based at least on the detector signal.

18. A method according to claim 17, wherein the step of detecting light further includes acquiring an image of the illuminated encoding features.

19. A method according to claim 17, wherein the step of determining a displacement further includes determining positions of peaks of light transmission through the encoding features.

20. A method according to claim 17, further including the step of storing each successive detector array value in each of successive groups of n software array elements.